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1. GAS INDUSTRY

Energy Resources

Gleeson, G. W. ENERGY—CHOOSE IT WISELY TODAY FOR SAFETY TOMORROW. *Heating, Piping and Air Conditioning*, 23, 107-114 (1951) August.

The article discusses all energy resources, classifying them as (1) continuous, such as water, wind and tidal power, and solar, earth, and tropical water heat, and (2) discontinuous, such as coal, petroleum, oil-shales, natural gas and atomic energy. Supplies, usage and future developments are discussed. Statistics and an modern bibliography are included.

O. P. Brysch

FPC Opinion on Phillips

Federal Power Commission IN THE MATTER OF PHILLIPS PETROLEUM COMPANY. Opinion No. 217 (1951) August 16.

A more detailed 150-page mimeographed account of Opinion No. 217 is now available from the Federal Power Commission. (See *Gas Abs.* 7, 169 (1951) Sept.)

O. P. Brysch

GAS STAND CLARIFIED. *Oil Gas J.*, 50, 50, 51 (1951) August 30.

Dismissing its test case against the Phillips Petroleum Co., the FPC conceded that the operation of large gas-transmission mains from producing fields to processing plants and the sale of gas to interstate pipe-line companies is an incident to production and gathering and is not subject to regulation under the Federal Natural Gas Act. The article quotes at length from the FPC's majority and dissenting opinions.

A. E. Neumann

Holding Company Act

McDonald, H. WHAT HAS THE HOLDING COMPANY ACT CONTRIBUTED TO THE INDUSTRY? *Gas Age*, 108, 33-36, 56-60 (1951) August 30.

The Public Utility Holding Company Act has remained unamended for 16 years in spite of the fact that it was a most controversial issue. Holding companies served a necessary function in the development of the industry, bringing together thousands of isolated companies. Public distrust of utilities arose in the 30's because of the carelessness of some executives, with the result that the Holding Company Act was drafted and enacted. Its success is attributed to the simplicity and workability of the act, wise administration by S.E.C. and finally the strength of utilities at top management levels. The good points and accomplishments of the act are discussed by the author, who is chairman of the S.E.C.

J. D. Parent

Natural Gas Industry

Hensley, H. L. TODAY'S NATURAL GAS INDUSTRY. *J. Petroleum Technology* 3, 9-12 (1951) August.

The author brings out a number of interesting points: (1) known reserves of natural gas are potentially greater than those of crude oil; (2) during 1949, 175.7 million bbls. of natural gas liquids were produced, including 20.4 million bbls. produced at lease separators; (3) during 1949, the natural gas liquids produced were equivalent to almost 10% of the crude oil produced; (4) oil and natural gas supply about 60% of the mineral fuel requirements today, whereas coal supplied about two thirds in 1920. (5) during 1948, nearly 70% of the marketed production of natural gas was consumed in the state where it was produced. (6) during 1948, nearly 76% of the natural gas produced was consumed in intrastate commerce (including pressure maintenance and cycling); (7) out of every dollar spent by the consumer in the North and East for natural gas only 7¢ goes to the producer, the remainder going to the transporter and distributor.

J. D. Parent

Restricted Gas Service

GAS CURBS HERE: PAD ORDER SLOWS GAS-SERVICE EXPANSION TO A WALK IN 15 STATES: NEW SPACE-HEATING AND LARGE-VOLUME USERS HIT. *Oil Gas J.*, 50, 103 (1951) August 23.

Expansion of natural gas service in 15 states and the District of Columbia has been severely curbed by PAD. The order is not effective in states with their own regulations safeguarding gas supply. Action is attributed to line pipe shortage.

J. D. Parent

2. APPLIANCES

Burners

Mueller, E. H. GAS BURNER CAP AND BASE JOINED BY BAYONET-TYPE FASTENING MEANS. U.S. 2,562,505 (1951) July 31.

An improvement in gas burner construction is proposed, comprising an iron burner-body and a separable cap-top with the usual flame parts. The cap is secured by bayonet-type lugs which grip tightly into slots with slight rotation.

O. P. Brysch

Parsberg, E. R., (assigned to Svenska Aktiebolaget Gasaccumulator) INCANDESCENT GAS BURNER. U.S. 2,564,371 (1951) August 14.

A burner is described for use in incandescent gas lights. Primary air is entrained at the gas nozzle and the resultant gas-air mixture is burned within a ceramic cap over the top of the burner head.

D. L. Nicol

Burner Control

Mayer, C. M. (assigned to The Tappan Stove Co.) OVEN CONTROL. U.S. 2,562,536 (1951) July 31.

Controls for a gas burner are described in which a solenoid when energized opens the gas supply valve and a time-control switch energizes the solenoid at predetermined times.

O. P. Brysch

Burner Valves

Mueller, E. H. VALVE FOR CONTROLLING GASEOUS FUEL. U.S. 2,561,531 (1951) July 24.

An improved valve for controlling the supply of gaseous fuel to a burner is described, in which the outlet orifice adjustments may be made from the handle-end and the operating stem, even when the valve is concealed.

O. P. Brysch

Gas Range Pilots

Hazel, C. S. WHY FLASH TUBE IGNITION IS BEST FOR MODERN AUTOMATIC GAS RANGES. *Gas Age*, 108, 19-22 (1951) August 2.

The essential advantages of gas ignition over electric ignition are outlined. These are (1) Retention of pilot load and pilot revenue. (2) Elimination of services of competitor. (3) Low installation cost. (4) Elimination of need for electrical outlet for stove. (5) Elimination of outside union on electrical installation. (6) Lower servicing costs. The essential advantages of single-point ignition over multi-point gas ignition are outlined. These are, elimination of (1) extra operating costs, (2) hot unused ovens, (3) hot kitchens resulting from several pilots.

D. L. Nicol

Incinerator

Hebert, J. W. (assigned to Valley Welding & Boiler Co.) INCINERATOR STRUCTURE WITH GAS BURNER, FLAME INSPECTION REFLECTOR, AND VENT PIPE ASSEMBLY. U.S. 2,562,270 (1951) July 31.

An arrangement of shielded gas burner and vent pipe is proposed for a garbage disposal unit, so that flame smothering is prevented.

O. P. Brysch

Water Heater

Epling, J. H. and Lyons, E. M. QUICK HEAT WATER HEATER. U.S. 2,561,465 (1951) July 24.

Rapid heating is obtained in the proposed water heater by special arrangement of a transverse baffle and the inlet-cold and outlet-hot water pipes.

O. P. Brysch

3. COMBUSTION AND INDUSTRIAL FURNACES

Flame Protective Devices

OVEN FLAME FAILURE DEVICES. *Ind. Finishing* (British) 4, 48, 50, 52-55 (1951) August.

Part three of this series on flame failure devices discusses the use of electronic flame conduction and photo-electric type safety devices. The installation and maintenance of these items is described. (See *Gas Abs.* 7, 136, 173, Parts I and II).

D. L. Nicol

Flue-Dust Removal

Veron, M. (assigned to the Babcock & Wilcox Co.) APPARATUS FOR EXTRACTION OF DUST FROM GASES BY FILTRATION. U.S. 2,564,316 (1951) August 14.

The inventor claims a new process for cleaning and filtering the combustion gases from a pulverized coal furnace. The system consists of passing the hot gases through a filter tray series containing sand or other finely divided refractory material. The apparatus provides for continuous feed of fresh filter medium and the removal of contaminated portion. The invention is claimed to operate at elevated temperatures and pressures and to obtain any desired degree of dust extraction.

W. G. Bair

Gas Furnaces

NEW GAS FURNACES. *Coke and Gas* (British) **13**, 293-298 (1951) August.

Recent developments in the design of industrial gas-fired furnaces in Great Britain are described. These include a ceramic kiln, a laboratory muffle furnace and a slot forge furnace.

D. L. Nicol

Gas Turbines

Alcock, J. F. (assigned to Ricardo & Co., England) MOLTEN METAL-AIR THERMAL POWER PLANT. U.S. 2,561,604 (1951) July 24.

The patent refers to a thermal power plant consisting of a working medium circulating in a closed system, a compressor driven by a turbine, and one or more heat exchangers for adding or taking away heat from the working medium. The working medium is an inert gas such as nitrogen. The heat conveying medium is a molten metal or metal alley. Because of its low melting point, high boiling point and high density, gallium is a desirable metal. The gallium is heated in a pipe coil by combustion of a fuel in a burner. The heat exchangers are essentially scrubbers where the gallium transfers the heat to the nitrogen by direct contact. A direct advantage of this power plant is that the heat transfer coefficient from the surface of the input heater to the gallium is much greater than the gas-tube coefficient with a gaseous medium.

E. J. Pyrcioch

Price, N. C. (assigned to Lockheed Aircraft Corp.) GAS TURBINE. U.S. 2,563,269 (1951) August 7.

This is a patent for a gas turbine that features hollow blades to permit cooling by air circulation.

E. J. Pyrcioch

Price, N. C. (assigned to Lockheed Aircraft Corp). GAS REACTION POWER PLANT WITH A VARIABLE AREA NOZZLE. U.S. 2,563,270 (1951) August 7.

This invention relates to a gas reaction power plant with a variable area nozzle for use in propulsion of aircraft and other high speed vehicles.

E. J. Pyrcioch

Price, N. C. (assigned to Lockheed Aircraft Corp.) GAS TURBINE POWER PLANT HAVING INTERNAL COOLING MEANS. U.S. 2,563,744 (1951) August 7.

This invention relates to a gas turbine power plant having an internal cooling means.

E. J. Pyrcioch

Heat Pump

Smith, M. M., and Kemler, E. N. (assigned to Muncie Gear Works, Inc.) HEAT PUMP. U.S. 2,562,748 (1951) July 31.

The patent refers to a heat pump to be used for space heating and cooling. During the heating cycle heat is obtained from available sources such as air and is supplemented by heat derived from equipment that utilizes fuel and furnishes power for operating the heat pump. The main equipment consists of an internal combustion engine, a refrigeration cycle apparatus having a compressor and a pair of heat exchange units, valves for controlling the heat exchange units selectively and a pair of air ducts.

E. J. Pyrcioch

High Velocity Burners

Peskin, L. C. HIGH-VELOCITY BURNERS CUT FUEL COSTS AND FURNACE SIZE. *Iron Age*, **168**, 63-66, Aug. 9; 104-107, Aug. 16 (1951).

Advanced combustion techniques are described, in which ram-jet types of gas and oil burners and improved heat transfer equipment are applied to industrial heating. Pressure pre-mix-

ing burner units of capacities up to 10 million Btu/hr/cu.ft. combustion space are possible. High-temperature convection heat-transfer, reducing atmosphere, standard ignition and flame controls, and small, controllable combustion space give promise of unusually compact steam-generators and heating furnaces. Part II of the article discusses possible applications to steel plant heating, such as in open-hearth, strip-mill and forge reheating, tinplate remelting and bright-annealing furnaces. A comparison is made of convection and radiant types of heating furnaces as affected by the emissivity of the material being heated.

O. P. Brysch

Multifuel Burners

Decker, W. H. MULTIFUEL BURNERS. THEIR APPLICATION AND DESIGN. *Mech. Eng.*, 73, 633-638, 661 (1951) August.

The author recommends that burners and furnaces be designed to be able to burn pulverized coal, gas, oil, or a combination of the three. It is claimed that for the service life of such a multifuel unit it is the most economical and flexible design. Rising fuel costs and availability of certain fuels do not effect the operation of such a unit. Several commercially available multifuel burners are described along with diagrams of each unit.

E. J. Pyrcioch

Stack-Dust Reinjection

Boer, E. J., Allen, J. M., and Landry, B. A. COLLECTION AND BURNING OF LOCOMOTIVE CINDERS. *Trans. Am. Soc. Mech. Engrs.*, 73, 543-551 (1951) July.

Steaming tests of the Norfolk and Western Railway locomotive No. 1112 equipped with a cinder collector designed at Battelle were conducted to determine the percentage collected and the percentage burned when returned to the firebox. Results of the tests, which were sponsored by Bituminous Coal Research, Inc., and the Norfolk and Western Railway, indicate that an average of 80 per cent of the cinders are separated from the flue gases and about half of the reinjected cinders are burned. By far the greater part of these burn in the bed, thereby releasing their ash on the grate. At the highest rate of burning used, the fuel consumption was reduced 55 per cent by collection and reinjection of cinders from the resultant-size coal. Substitution of a double-screened coal for the resultant size gave, with collection and reinjection, an over-all reduction in fuel consumption of 16.4 per cent and a reduction in stack emission of 65 per cent, as compared with the use of the resultant size without collection and reinjection.

Author's Abstract

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Bundy, F. P. MEASUREMENT OF VELOCITY AND PRESSURE OF GASES IN ROCKET FLAMES BY SPECTROSCOPIC METHODS. p. 224

4. CARBONIZATION AND GASIFICATION

British Coke Distribution

ENSURING A FAIR DISTRIBUTION OF COKE. *Gas World* (British) 143, 121 (1951) August 11.

Registration of coke consumers, discontinued in June 1950, has been reimposed on Aug. 13, 1951, to ensure fair distribution of coke for domestic and residential use. Consumers upon registering with their suppliers, (gas works and coke ovens) will be entitled to buy 2 tons for the year. In the first 12 summer weeks of 1951, consumption totalled 5,345,000 tons, as compared to 4,811,000 last year. Although oven coke production has increased 4.5% during the period, and gas coke 5.7%, this has been consumed by gas works as water gas fuel, and for other industrial uses. The plan is not one of rationing but rather of distribution.

O. P. Brysch

Carbon Electrodes

Shea, F. L., Jr., and Juel, L. H. (assigned to Great Lakes Carbon Corp.) MANUFACTURE OF CARBON ELECTRODES. U.S. 2,563,285 (1951) August 7.

Improvements in the process of manufacture of carbon electrodes are claimed which comprise the impregnation of the calcined + 50-mesh carbon particles with a low-melting hydrocarbon impregnant, the selection and proportioning of

pitch binders and the proper blending of impregnated particles, binder and unimpregnated flour-carbon filler at temperatures above the melting point of the binder, after which the plastic mix is molded to shape and baked. Reduced swelling and increased density, conductivity and strength are claimed.

O. P. Brysch

Coal Properties

Crick, R. G. SOLVENT EXTRACTION OF LIGNITES AND BITUMINOUS COALS. *Fuel* (British) 30, 187-190 (1951) August.

The compositions of extracts obtained from the same coals by a number of solvents were investigated, because of certain observations on catalytic action of bituminous coals in condensation of the solvents used as extractants. It was shown that dioxan gives high results in all cases, and that pyridine-chloroform had the most desireable properties as extractants.

I. Ladany

CO-H_2 Recovery

Sowden, P. T., Jr. (assigned to Phillips' Petroleum Co.) RECOVERY OF CARBON MONOXIDE AND HYDROGEN FROM HIGH NITROGEN CONTENT GAS. U.S. 2,564,236 (1951) August 14.

A process for the recovery of carbon monoxide and hydrogen from high-nitrogen content gases is described. First, the gas is subjected to a water gas shift to convert carbon monoxide to carbon dioxide and nitrogen. Second, the hydrogen is split by sorption means into hydrogen, carbon dioxide and nitrogen. Third, the hydrogen and carbon dioxide are admixed and subjected to a reverse water gas shift to convert at least a portion into carbon monoxide. A mixture of carbon monoxide and hydrogen is recovered.

C. H. Riesz

Coke Oven

Wethly, F. (assigned to Allied Chemical & Dye Corp.) VERTICALLY FLUED RICH GAS FIRED COKE OVEN BATTERY. U.S. 2,564,140 (1951) August 14.

A vertically-flued rich-gas-fired coke oven battery of the gas-gun type is claimed, designed to withstand the pressures exerted by low-volatide coals by providing heating flues for *each* wall of each oven in the battery so that it comprises a self-contained heating and regenerative unit and *separating each such unit from the others by a massive refractory wall* of four times the thickness of the heating wall.

O. P. Brysch

Wethly, F. (assigned to Allied Chemical & Dye Corp.) VERTICALLY FLUED COKE OVEN BATTERY HAVING HIGH AND LOW BURNER NOZZLES IN THE FLUES. U.S. 2,564,141 (1951) August 14.

A vertically-flued coke oven battery is claimed in which improved uniformity of heating is attained by alternate arrangement of low-burner and high-burner nozzles in the heating wall, and by gradually decreasing the height of the high-burner nozzles toward the coke-side of the battery. Uniform coking and elimination of hot tops is claimed for any oven-type of flue arrangement, regeneration system, and fuel feed system.

O. P. Brysch

Coking Coal Reserves

Dowd, J. J., Turnbull, L. A., Toenges, A. L., Abernethy, R. F., and Reynolds, D. A. ESTIMATE OF KNOWN RECOVERABLE RESERVES OF COKING COAL IN ARMSTRONG COUNTY, PA. U.S. Bureau of Mines Report of Investigations 4801 (1951) July.

This fourth report in the county coking-coal survey series gives data on Armstrong County. Pa. The surveys are made from the records of coal property owners, plotted upon enlarged quadrangle maps as "indicated" and "measured" areas of reserves, according to thickness, for each bed. The Upper Freeport and Lower Kittanning are the major beds; the Pittsburgh, Lower Freeport, Upper Kittanning, Middle Kittanning, and Clarion are minor beds. Known measured plus indicated reserves more than 14 inches thick are estimated at 1,550 million short tons. Of these, the recoverable 28-inch and thicker beds amount to 1,242 million tons, but based upon the weighted average % recovery of 46.24% for all beds, only 574 million tons remain as recoverable as of January 1, 1949. This is 24% of Sisler's 1922 estimate, and 95% of Ashley's 1942 estimate. Maps, tabulations by quadrangle, and seam sections and analyses are given for each bed. The coals are all high-vola-

tide A in rank, but little or none have been used for metallurgical coke even in blends because of lower rank and high sulfur (2 to 4%). (The first three reports of this series have been noted in *Gas Abstracts*, 6, 219 (1950) and 7, 21; 139 (1951).

O. P. Brysch

Dowd, J. J., Turnbull, L. A., Toenges, A. L., Abernethy, R. F., and Reynolds, D. A. ESTIMATE OF KNOWN RECOVERABLE RESERVES OF COKING COAL IN WESTMORELAND COUNTY, PA. U.S. Bureau of Mines Report of Investigations 4803 (1951) August.

The fifth report in the series on reserve of coking coals by counties deals with Westmoreland County, Pa. The major coal beds are the Pittsburgh and the Upper Freeport; the minor beds are the Waynesburg, Redstone, Lower Freeport, and Lower Kittanning. Known reserves are estimated (14-inch minimum bed thickness and 1800 tons per acre-foot of coal) at 922 million short tons, of which the beds of thickness 28 inches and upward are 899 million tons. 523 million tons are estimated as recoverable, based on present weighted average recovery of 58.25%. This estimate is about 46% of that of Ashley (1942) and 18% of Sisler's (1922). The coals are coking, of high-volatile A and medium-volatile bituminous rank. Maps and tables of reserves by bed and quadrangle and tables of seam sections and analyses are given.

O. P. Brysch

Dowd, J. J., Turnbull, L. A., Toenges, A. L., Abernethy, R. F., and Reynolds, D. A. ESTIMATE OF KNOWN RECOVERABLE RESERVES OF COKING COAL IN FAYETTE COUNTY PA. U.S. Bureau of Mines Report of Investigation 4807 (1951) August.

This sixth report in the county coking coal survey series deals with Fayette County, Pa., the famous early coke region of Connellsville, Uniontown and Brownsville. Present major producing beds are the Pittsburgh and Sewickely; minor beds are the Waynesburg, Redstone, Upper Freeport, Lower Kittanning and Brookville-Clarion. Known measured plus indicated reserves more than 14 inches thick are estimated at 943 million short tons. Of the 841 million tons of 28-inch and thicker beds, 460 million tons are recoverable, estimated from the 55.41% weighted average recovery for all beds. 7% of the original acreage of the Pittsburgh bed remains, containing 80 million tons recoverable. Total county recoverable is 23% of Sisler's 1922, and 17% of Ashley's 1942 estimates. Maps, tabulated reserves by quadrangle, seam sections and analyses are given. The coals are high-volatile A and medium-volatile in rank. All are coking, but most of them require cleaning and blending to produce metallurgical coke.

O. P. Brysch

Coking Process

Institute of Gas Technology. CARBONIZATION OF COAL. British Patent 632,155 (1951) July. *Gas World* 134, 106, 108 (1951) August 4.

This is the British patent corresponding to U.S. 2,512,076 of June 20, 1950, to A. D. Singh, assigned to the Institute of Gas Technology. It pertains to a method of making coke from medium- or high-volatile coking coals by a preliminary low-temperature carbonization in a fluidized bed to form a char; the char (non-agglomerated) is then mixed with additional amounts of coking coal and this blend carbonized by a high-temperature process to yield high grade metallurgical coke. Steam or hot gas (430° C.) may be used as a fluidizing gas in the preliminary step. Here also, to offset the low bulk density in final coke, 0.5 to 20% of iron ore fines are added. Fine dusts are recovered by cyclone separators and returned to the fluidized bed. Char of any volatile content may be produced and the gas, oils and tars recovered. Such char also is suitable as fuel for water gas generators.

O. P. Brysch

Continuous Carbonizing Retort

Huff, L. C. (assigned to Universal Oil Products Co.) DISTILLATION OF CARBONACEOUS SOLIDS. U.S. 2,560,767 (1951) July 17.

The inventor proposes a vertical retort for distilling oil shales, tar sands, coal or like solids. The material enters at the top and feeds by gravity through a series of contact chambers for preheating, initial distillation, final distillation, purging, combustion, oil-gas cracking, and cooling; each process occuring independently by direct contact of gases with the continuously flowing bed of solids supported on a sloped oscillating grate.

O. P. Brysch

Electrostatic Purification

Sykes, W., and Broomhead, F. PROBLEMS OF ELECTRICAL PRECIPITATION REVIEWED. *Gas World* (British) 134, 98-104 (1951) August 4.

This article gives some idea of the very wide application and usefulness of the electrical precipitation process and of the problems involved in the design of equipment to meet the varied requirements of industry. Among the problems are insulator breakdown, gas distribution, and removal of deposits from electrodes. Insulator breakdown is prevented by baffling so as to keep the insulators out of the normal route of the flow of gas, and by keeping the precipitator temperature above the dew point. Gas distribution is dealt with by designing inlet and outlet so as to avoid sudden changes in gas velocity, and using perforated plates or louvres and vanes to distribute the gas to the electrodes. Deposits are removed by vibrating and rapping the positive electrodes individually, so as to minimize re-entrainment; and—in the case of sticky deposits—by introducing upstream from the precipitator an oil fog which, when precipitated, increases the fluidity of the deposits.

J. J. Guyer

Wilson, J. H. (assigned to Research Corp.) ELECTRICAL PRECIPITATOR, INCLUDING AN ELECTRODE WASHING DEVICE. U.S. 2,563,297 (1951) August 7.

A precipitator of improved efficiency is described in which extended surface electrodes are provided which can be flushed by properly arranged jets of washing fluid.

O. P. Brysch

Fluidized Coal Transport

Albright, C .W., Holden, J. H., Simons, H. P., and Schmidt, L. S. PRESSURE DROP IN FLOW OF DENSE COAL-AIR MIXTURES. *Ind. Eng. Chem.*, 43, 1837-1840 (1951) August.

Tests were conducted to determine the pressure drop in the flow of mixtures of air and coal through horizontal tubes. The size of the coal particles used was 90% through 200-mesh, the coal-air ratio was 200 lb.coal/lb.air. Tubes used ranged from 3/16 to 0.5 inches internal diameter. Empirical equations were developed from the data, giving pressure drops as functions of mass velocity and tube diameter. A table of the experimental data along with graphs is included.

E. J. Pyrcioch

Foundry Coke Research

Lownie, H. W., Jr. NEED STRONGER FOUNDRY COKE. *Foundry* 79, 72-76 (1951) July.

The study by the Gray Iron Research Institute in 1942 on effects of coke on cupola operations led to two conclusions: (1) stronger cokes gave better performance, which fact has been supported by much additional evidence and (2) cokes that performed well in the cupola gave a high temperature rise rise in the (oxygen) combustibility test, which *has been discarded as undependable* during the past 9 years. Of numerous tests on cokes in the past 9 years, no single test has been developed to predict completely the coke performance in a cupola, partly because of wide differences in requirements of various foundries. The Battelle pilot cupola has given more dependable performance data during this period. The noticeable decline in coke quality from 1942 to 1950 is shown by graphs and tables of carbon pickup and tapping temperature. Commercial-scale studies in a 54-inch cupola are given for a 16-hour and a 28-hour foundry coke. The latter was consistently better, primarily because of greater strength and size. A 1951 questionnaire to 21 foundries shows that these two properties today are most important in the opinion of practical experience. Present day weaker coke is used under additional costs entailed by more careful handling, blast preheating, and blast-drying.

O. P. Brysch

Gas Dehydration

Saueressig, H. P. COOLING GAS TO HALT CORROSION. *Gas* 27, 34-36 (1951) August.

In order to eliminate the corrosion of a city distribution system by condensed water the gas was cooled to reduce the moisture content. A soil survey showed a minimum ground temperature of 64° F. The system—a steam jet water vapor refrigeration unit—was designed to provide a maximum dew-point 2° F. below the minimum ground temperature. (See also *Gas Abs.* 7, 128 (1951) July.)

B. E. Hunt

Methane from Coal Mines

Minchin, L. T. METHANE DRAINAGE AT A BRITISH COLLIERY. *Gas World*, (British) **134**, 95, 97 (1951) August 4.

Considerable quantities of natural gas can be recovered from some coal seams. The exploitation of "fire damp" is an established fact at one British colliery, and it is recommended that such be considered for others. Large quantities of gas have been wasted in the past.

J. D. Parent

Oil Gasification

Burnside, J. P. THE USE OF SUBSTITUTES FOR GAS MANUFACTURE DURING PERIODS OF SHORTAGE OF NORMAL COAL SUPPLIES. *Nat. Gas Bull.* (Australia) **15**, 4-14 (1951) May-June.

The article discusses the Australian plant practice for increasing gas production during coal shortages. They use all the usual methods of oil gasification. They also gasify oil in the coke ovens during the coking run when coking low-volatile coals. This produces the equivalent of a normal coke oven gas in heating value. The author describes the processes in detail including sketches of equipment. The Australian feeling is that gas shortages must be avoided even if the substitute gases are produced at higher cost. The gas company gains in goodwill more than it loses on the high price gas.

W. G. Bair

Stanier, H., and McKean, J. B. PRODUCTION OF TOWN GAS BY THE CATALYTIC GASIFICATION OF PETROLEUM OILS. Inst. Gas Engrs. Publ. No. 375/176 (1951); *Gas Times* (British) 68, 105-109 (1951) July 27.

After a brief review of the general processes of oil gas manufacture a description is given of the successful laboratory and pilot plant research on catalytic oil cracking with alkaline-earth catalysts. A 63:34:3 bauxite, calcium carbonate, bentonite molded catalyst shape was used, and fuel oils up to the heaviest gave yields of 1.3 therms per gal. of 500 B.Th.U. gas at a rate of 2.6 gal. oil/cu.ft./hr. with very low tar and carbon formation. The catalyst, in a bed of 10 in. diameter and 6 ft. height with blow-and-run cyclic heating (3 minutes each), received the oil and superheated steam at the top, and the gas leaving the base was passed through an air preheater and a scrubber-cooler. A 1 MMCF/day full-scale unit has been completed.

O. P. Brysch

Suspension Gasification

Gaucher, L. P. (assigned to The Texas Co.) PRODUCTION OF CARBON MONOXIDE AND OTHER GASES FROM CARBONACEOUS MATERIALS. U.S. 2,558,746 (1951) July 3.

A process for the generation of hydrogen and carbon monoxide from carbonaceous material is described using a vertical cylindrical reactor operating from 2000 to 3400° F. and 0 – 100 psig and above. Reactant fluids consisting of oxygen-coal mixtures are introduced taugentially either at the top or at the bottom of the reactor while superheated steam is added through a multiplicity of inlet nozzles disposed at an inclination of say 30° on the periphery of the vessel.

C. von Fredersdorff

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Compressor Maintenance

Caldwell, J. H. PREVENTIVE MAINTENANCE A PRACTICAL PROGRAM FOR COMPRESSOR ENGINES. *Gas* **27**, 85-92 (1951) August.

The author recommends a log of events, from which graphs of data from hourly, daily, weekly, monthly, and semi-annual readings indicate engine condition and, therefore, the exact time when overhaul or adjustment is necessary.

J. J. Guyer

Condensate Removal

Echterhoff, J. H. REMOVAL OF LIQUIDS FROM NATURAL GAS BEFORE ENTERING PIPE LINES. *Petroleum Engr.* **23D**, 25-31, (1951) July 15.

The two types of liquefiables that must be removed are hydrocarbons and water. Hydrocarbons can be removed by processing through a natural gasoline plant and by separation through a low temperature separator. Water

vapor removal is accomplished using a liquid desiccant system, a solid desiccant system, or a low-temperature separator. Descriptions of the various types of plants used to accomplish the above are given. C. L. Tsaros

Cracking Catalysts

Riesz, C. H., Dirksen, H. A., Kirkpatrick, W. J. SULFUR POISONING OF NICKEL CATALYSTS. Institute of Gas Technology, Chicago, *Research Bulletin* 10 (1951) September.

By the beginning of 1950 it was apparent that catalytic cracking had achieved acceptance as an important means of producing peak load and base load water gas equivalents, especially in the Eastern area of the United States. This acceptance had been predicated upon the use of low-sulfur feed stocks to avoid the investment costs of sulfur-purifying equipment hitherto considered necessary when using highly active nickel catalysts. The work described herein was conducted during 1950 and was directed to a determination of the effects of various kinds of organic sulfur and the amounts which industrial units might be expected to tolerate when operated for the production of fuel gas. A systematic study was made of the relative performance life and activity of a commercial nickel catalyst when steam-gasifying a natural gasoline to which various sulfur compounds were added in controlled concentrations. The results obtained in this limited laboratory system appear to have broad significance. First, the catalyst life, or capacity before regeneration becomes necessary, and the catalyst conversion efficiency, are found to vary widely and independently with the kind as well as the amount of sulfur compound present. Second, the performance of nickel catalysts in the presence of sulfur can be improved considerably by appropriate selection of feed rates, steam concentrations, and operating temperatures. Specifically, the addition of process air invariably lengthens the operating period before regeneration becomes necessary. Third, no permanent impairment of the nickel catalyst need be caused by sulfur in any amount or form if proper conditions of catalyst regeneration are observed. In every case it was found possible to restore the catalyst to its original effectiveness, provided excessive temperatures during regeneration were avoided. Thus the economics of sulfur purification is directly resolvable by balancing its cost against the loss of plant capacity due to downtime for catalyst regeneration and to decreased catalyst activity. As an alternative approach some "sulfur-active" nickel sulfide catalysts, prepared under the auspices of the International Nickel Company at Mellon Institute, were tested for use in catalytic cracking. Results obtained in the catalytic steam reforming of natural gas indicate that at the relatively lower temperature levels required, nickel sulfide catalysts are not sufficiently active to be competitive with the commercial metallic nickel catalysts now in use. Authors' Abstract

Equilibrium Research

Elbishlawi, M., and Spencer, J. R. EQUILIBRIUM RELATIONS OF TWO METHANE-AROMATIC BINARY SYSTEMS AT 150° F. *Ind. Eng. Chem.* 43, 1811-1815 (1951) August.

Experimental vapor equilibrium data on the methane-benzene and methane-toluene systems at a temperature of 150° F. are presented. The data were collected up to the critical pressure for both systems. A correlation based on the U.O.P. characterization factor is presented for determining the solubility of methane at 150° F. in various heavy components.

O. T. Bloomer

Field Flow Research

Dykstra, H. and Parsons, R. L. RELAXATION METHODS APPLIED TO OIL FIELD RESEARCH. *J. Petroleum Technology* 3, 227-232 (1951) August.

Three methods of solving problems of flow through porous media are used: analytical, electric analog and graphical. The relaxation method of Southwell is a relatively new graphical method and is highly regarded for speed and accuracy. The authors have applied the relaxation method to steady state flow of fluids through porous media with considerable success.

J. D. Parent

Liquified Gas Storage

Jackson, J. O. (assigned to Pittsburgh-Des Moines Co.) DOUBLE WALLED INSULATED TANK OR CONTAINER FOR STORING LOW-TEMPERATURE LIQUEFIED GASES. U.S. 2,563,118 (1951) August 7.

This invention relates to a double walled insulated cylindrical tank for storing at atmos-

pheric pressure relatively large quantities of liquified gas such as natural gas. The tank is designed for capacities in excess of 50,000 cubic feet and can be fabricated from plate of less thickness than is necessary in a spherical container of the same capacity because of improved means of supporting the inner shell so that it is free to expand independently of the outer shell. The design of the tank is such that the cost per cubic foot of storage capacity decreases with increasing capacity even beyond 80,000 cubic feet.

O. T. Bloomer

LP Gas Handling

Smith, L. W. TRANSFERRING LP-GAS WITH LIQUID PUMPS. *Butane-Propane News* **13**, 74-80 (1951) August.

Various sources for the formation of vapor (in the pump) due to heat are discussed. The most practical means to prevent the vapor locks are (1) making the inlet pipe slope upwards to the tank and (2) installing the hand operated by-pass valve which will recirculate liquid back to the tank.

D. C. Gami

LP Gas Production

Alden, R. C., Gilmore, F. E., and Tucker, P. W. LPG. PRODUCTION NOW EXCEEDS MILLION BARRELS DAILY. *Oil Gas J.* **50**, 122, 125, 126, 129, 152-155 (1951) August 23.

An analyses of production, consumption and reserves of LPG. is presented. It is concluded that it does not seem likely that past uses can keep pace with the growing rate of production. New markets are sought and the direct use of LPG. as motor fuel is promising. Data are given indicating that recovery of LPG. as liquid products amounts to alone 0.50 gallon per Mcf. in contrast to an availability of about 2.3 gallons per Mcf. Propane-butane contents of gases from several areas are given.

J. D. Parent

Main Purging

Judd, H. C. DETERMINING THE PURGING VELOCITY FOR A 10-INCH, 8½-MILE MAIN. *Gas Age* **108**, 47, 48 (1951) August 16.

The procedure followed in purging a 10-inch, 8½-mile main with nitrogen is described. This main was equipped with valves and 3-in. blow-offs at both terminals and at 7,000-ft. 15,000-ft., and 38,000-ft. stations. The first 7000-ft. section was filled with nitrogen prior to the introduction of natural gas.

B. E. Hunt

Odorization

White, C. E. MONITORING FUEL GAS LEVELS WITH A NEW ODORIMETER. *Gas* **27**, 51, 52 (1951) August.

This new odorimeter operates using a single stream of feed gas. A measured proportion of this gas passes through activated carbon and is deodorized. This deodorized gas is then mixed with the remainder of the feed gas and passes to the nosepiece for odor estimation. Good agreement with a closed-room test at 1% was obtained using this simplified portable instrument.

C. E. Hummel

MALODORS: $MILLION MARKET. *Chem. Week* **69**, 11 (1951) August 11.

This article gives a history of the Natural Gas Odorizing Co. of Houston and describes its present business. Recent developments of the company include an oxidation-resistant compound to replace ethyl mercaptan as an odorizing agent, and a tank truck approved by ICC for transporting methyl mercaptan.

C. E. Hummel

Pebble-Heater Reformers

Hepp, H. J. (assigned to Phillips Petroleum Co.) HYDROCARBON CONVERSION IN A PEBBLE HEAT EXCHANGER. U.S. 2,554,407 (1951) May 22.

The pebble heater is adopted to the cracking of hydrocarbons, particularly ethane and/or propane at temperatures between 1400 and 1700° F., provision being made for the removal of tar and carbon from the system by condensing and filtering these substances through a side stream of cool pebbles introduced on top of the bed of hot solids.

C. von Fredersdorff

Morse, H. H. (assigned to Phillips Petroleum Co.) METHOD OF EFFECTING CONTACT IN A PEBBLE HEATER. U.S. 2,555,052 (1951) May 29.

The patent relates to a method of effecting uni-

form flow of solids in a pebble heater by interposing two conical members immediately above the solids outlet. The method is applicable to the pyrolysis of hydrocarbon gases.

C. von Fredersdorff

Robinson, S. P. (assigned to Phillips Petroleum Co.) LARGE SCALE PEBBLE HEATING CHAMBER. U.S. 2,552,063 (1951) May 8.

Various arrangements of large scale pebble heaters for gas having improved means of gas distribution and low pressure drop are presented. One particular setup discussed in detail is a rectangular pebble heater having twin pebble chambers of large height to width ratio, provided with adjacent heated walls suitably baffled so that the heat-exchange fluid traverses the pebble bed in a direction perpendicular to the flow of pebbles.

C. von Fredersdorff

Weber, L. J. (assigned to Phillips Petroleum Co.) APPARATUS FOR EFFECTING CONTACT BETWEEN A GAS AND A DOWNWARDLY FLOWING CONTIGUOUS MASS OF PEBBLES. U.S. 2,554,435 (1951) May 22.

The patent relates to a pebble heater arrangement having movable pebble inlet and gas inlet sections to change the depth of the pebble bed and having a step-type gas distributor composed of a series of inverted concentric troughs. The system is useful for pyrolysis of hydrocarbon gases.

C. von Fredersdorff

Pressure Regulating Stations

McCamish, H. M. CRITERIA FOR SELECTING THE OPTIMUM DESIGN FOR A DISTRIBUTION REGULATOR STATION. *Gas* 27, 40-45 (1951) August.

The author discusses three regulator stations in view of the 10 criteria for good design discussed in part I (Gas Abstracts, 7, 184 (1951) August). The development of a completely engineered design for a standard installation is recommended.

B. E. Hunt

Sulfur Recovery

Miller, E. B. (assigned to Jefferson Lake Sulphur Co.) METHOD OF DESULPHURIZATION OF GASES. U.S. 2,561,990 (1951) July 24.

In this method of recovering sulfur from gases, a series of tubular catalyst beds is rotated through the gas desulfurization, sulfur recovery, and catalyst regeneration zones of the converter. The sour gas is desulfurized by passage at 200° C. through two reaction zones in series. Sulfur is recovered by treatment of the spent catalyst with steam at 800° F., followed by liquefaction of the elemental sulfur. The catalyst (iron oxide on granular silica gel) is regenerated using air at 1000° F.

C. E. Hummel

Weber, G. SIMPLICITY AND AUTOMATIC OPERATION FEATURE LION OIL'S NEW SMALL-SIZE SULFUR CONVERSION PLANT. *Oil Gas J.* 50, 130, 152-155 (1951) August 23.

This unit has been designed to recover ten tons of sulfur per day from sour residue gas of a Girbotol plant. Sulfur dioxide (formed by the combustion of one-third the hydrogen sulfide of the feed gas) is reacted with the remainder of the hydrogen sulfide over activated alumina catalyst at 650° F. The sulfur is condensed giving an 89-92 per cent yield of 99.8 per cent pure product. Due to the installation of automatic controls, no additional operators are required for this addition to the gas treating plant.

C. E. Hummel

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Culberson, O. L. PHASE EQUILIBRIA IN HYDROCARBON - WATER SYSTEMS. III. SOLUBILITY METHANE-WATER. p. 225

Minchin, L. T. METHANE DRAINAGE AT A BRITISH COLLIERY. p. 216

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Aromatics by Platforming

Haensel, V. AROMATICS PRODUCTION BY THE PLATFORMING PROCESS. *Oil Gas J.* 50, 80, 82, 84 (1951) August 9.

The platforming of gasoline fractions for aromatics is discussed. It is estimated that a total of 600-800 million gallons per year are potentially available from straight-run and natural gasoline fractions produced in this country. The

production of 200 million gallons a year of benzene is a distinct possibility and would represent a diversion of only about 0.5% of the present gasoline supply. The potential production of toluene is 1,600 million gallons and of ethylbenzene and xylenes, 2,000 million gallons annually.

C. H. Riesz

Williams, C. R. and Sutherland, R. E. PRODUCTION OF AROMATICS FROM NATURAL GAS LIQUIDS. *Oil Gas J.* **50**, 84, 88, 101 (1951) August 9.

The economics of platforming natural gas liquids to produce benzene are considered. For a light natural gasoline, the platforming investment for a 1000 bbl/day plant will be recovered in 0.9 year. In a second case, the natural gasoline already contains 4.3% benzene; the economical plant size in this case is 8,000-12,000 bbl./day.

C. H. Riesz

Bitumen Transport

HOT BOAT RIDE. *Chem. Week* **69**, 31 (1951) September 8.

Molten bitumen is transported across the Atlantic in three new 9,000 ton tankers, each of which carries 4,000 tons in steam-heated tanks. The new procedure effects savings in transport, time and labor. C. H. Riesz

Catalytic Cracking

Ardern, D. B. (assigned to Houdry Process Corp.) PROCESSES EMPLOYING FLUENT SOLIDS. U.S. 2,561,409 (1951) July 24.

In a catalytic cracking process of the Houdriflow design, regeneration is performed in two steps. The first of the two steps produces relatively wet flue gases which are subsequently used to elevate the regenerated catalyst to the reactor. C. H. Riesz

Ardern, D. B. (assigned to Houdry Process Corp.) PROCESSES EMPLOYING FLUENT SOLIDS. U.S. 2,561,771 (1951) July 24.

In a catalytic cracking process of the Houdriflow design, regeneration is performed in two steps. The second of the regenerating steps produces relatively dry flue gases, which are subsequently used to elevate the regenerated catalyst to the reactor. C. H. Riesz

Barker, J. W. (assigned to Houdry Process Corp.) CATALYST REGENERATION. U.S. 2,561,331 (1951) July 24.

A process for regenerating carbonized catalysts is claimed. The catalyst passes downward through a plurality of zones each of which has a separate inlet for oxygen-containing gas and a flue gas outlet. The downwardly moving bed is subjected to increased gas pressure in each succeeding combustion stage.

C. H. Riesz

Bond, G. R., Jr. (assigned to Houdry Process Corp.) PREPARATION OF A SILICA-METAL OXIDE GRANULAR CATALYST. U.S. 2,562,888 (1951) August 7.

Silica-alumina or silica-zirconia catalysts are prepared by reacting sodium silicate with a water soluble salt of aluminum or zirconium, all solutives being relatively concentrated so that a product concentration of at least 150 grams per liter of total mass is obtained.

C. H. Riesz

Peavy, C. C. (assigned to Houdry Process Corp.) CATALYST REGENERATION. U.S. 2,561,408 (1951) July 24.

Catalysts containing carbonaceous deposits accumulated in catalytic cracking of hydrocarbons are regenerated by downward passage through a combustion zone. The novelty of the patent lies in the introduction of cold oxygen-containing gases at an intermediate point in the zone, the gases being split to move in opposite directions through relatively deep compact beds of moving contact mass, above and below the gas inlet point. C. H. Riesz

Fischer-Tropsch Synthesis

Kirshenbaum, I., and Grover, R. K. (assigned to Standard Oil Development Co.) HYDROCARBON SYNTHESIS PROMOTOR. U.S. 2,563,607 (1951) August 7.

Yields and selectivity are improved in the synthesis of hydrocarbons from carbon monoxide and hydrogen by the addition of acetylene. The acetylene may constitute from 1 to 25% by volume of the synthesis gas, which must have a low oxygen content, 0.01 to 0.1%, to avoid cuprene formation. Eight electron microscope pictures of iron catalysts are included in the patent description. C. H. Riesz

Martin, H. Z., and Mayer, I., and Tyson, C. W. (assigned to Standard Oil Development Co.) REGENERATION OF AN IRON CATALYST WITH CONTROLLED CO_2:CO RATIOS. U.S. 2,562,804 (1951) July 31.

Iron catalysts carbonized by use in the Fischer-Tropsch synthesis of hydrocarbons can be regenerated by gases containing carbon dioxide and carbon monoxide but no free oxygen. The partial pressure ratio of carbon dioxide-to-monoxide must be maintained within limits (defined in the patent) which vary with temperature. Within these limits, the carbon deposits are oxidized but the iron catalyst is unaffected.

C. H. Riesz

Mayer, I. (assigned to Standard Oil Development Co.) HYDROCARBON SYNTHESIS WITH CATALYST RECONDITIONING. U.S. 2,562,806 (1951) July 31.

Iron catalyst used in the synthesis of hydrocarbons from carbon monoxide and hydrogen is activated by a pretreatment or carbiding with tail gases from which carbon dioxide had been removed either partially or completely.

C. H. Riesz

Palm, J. W. and King, J. A. (assigned to Cities Service Oil Co.) SOLVENT EXTRACTION OF ORGANIC ACIDS. U.S. 2,563,739 (1951) August 7.

Organic acids are extracted from aqueous solutions derived in Fischer-Tropsch synthesis. Methyl ethyl ketone is added to the extraction tower at a point above the introduction point of isopropyl ether, the extract containing the acids being recovered at the top while the stripped solution passes out at the bottom.

C. H. Riesz

Fluid Bed Mixing

Askins, J. W., Hinds, G. P., and Kunreuther, F. FLUID CATALYST-GAS MIXING IN COMMERCIAL EQUIPMENT. *Chem. Eng. Progress* **47**, 401-404 (1951) August.

Gases have been withdrawn from a 40-foot diameter commercial fluid catalyst regenerator at some 20 sampling points. The gas analysis data indicate that a high degree of gas down-mixing occurs in the 15 feet of bed depth, since the composition is essentially the same throughout the bed. The oxygen contact is uniformly low but there appears to be some transport of carbon dioxide by adsorption on the catalyst from a lower portion of the bed to upper sections. It appears probable that most of the gases introduced pass through the bed in the form of bubbles; within the individual bubbles, catalyst may "rain" down with a less intimate degree of contact between gas and catalyst than exists in the interstices of the fluidized bed. A fluid bed with a small length-to-diameter ratio may be inefficient and it may be desirable to insert baffles or redistributors to minimize down-mixing. This would apply especially to reactions where high conversion is desired or where the products formed inhibit the reaction.

C. H. Riesz

Hydrogenation Catalysts

Hawley, H. K. (assigned to The Procter and Gamble Co.) PREPARATION OF A COPRECIPITATED NICKEL-ZIRCONIUM CATALYST. U.S. 2,564,331 (1951) August 14.

The preparation of a co-precipitated nickel-zirconia catalyst suitable for hydrogenation is described. The procedure comprises the formation of a clear aqueous solution by adding 3 equivalents of sodium carbonate to one of a zirconium salt. This solution is mixed with an aqueous solution of a nickel salt at about 165° F., the pH of the resulting slurry not being allowed to fall below 8.2. The precipitate is washed, dried and reduced.

C. H. Riesz

Kandiner, H. J., Hiteshue, R. W., and Clark, E. L. CATALYST EVALUATION AND MIDDLE OIL PREPARATION IN AN EXPERIMENTAL HIGH PRESSURE COAL HYDROGENATION PLANT—PART I. *Chem. Eng. Progress* **47**, 392-396 (1951) August.

Operating results from the Bureau of Mines pilot-plant coal hydrogenation at Bruceton are reported. Five liquid-phase hydrogenation runs at 860° F. and 3500 psig were made on Rock Springs coal with tin, zinc, iron and nickel catalysts and also in the absence of any added catalyst. The exceptional activity of tin catalysts could be closely duplicated in regard to lique-

faction and "asphalt" formation by nickelous chloride catalyst impregnated from aqueous solution on the raw coal. Difficulties in obtaining stable operating results due to build-up of catalyst and solids concentration in the converter as well as residual catalytic effects are discussed.

C. H. Riesz

Montgomery, C. W. (assigned to Gulf Research & Development Co.) LOW-PRESSURE HYDROGENATION PROCESS. U.S. 2,561,530 (1951) July 24.

In processes such as hydrogenation or hydrodesulfurization with a transition group metal supported on a carrier, the amount of catalyst metal dispersed on the surface must be maintained below 0.8 of the statistical monolayer required for complete coverage. A formula for computing the number of monolayers is included in the patent claims.

C. H. Riesz

Hydrogenation Project

SYNTHETICS PUSHED. *Oil Gas J.* **50**, 52 (1951) August 30.

Testimony before the House interstate commerce committee indicated that plans for a government-subsidized 30,000 bbl./day coal-hydrogenation plant are still in a "formative stage."

C. H. Riesz

Petroleum Scarcities

Weber, G. NEEDED: MORE AVGAS. *Oil Gas J.* **50**, 95 (1951) August 23.

Increased military requirements and the closing of the Abadan refinery has led to a short supply of high octane aviation gasoline. Jet fuel supplies will also be limited in 1952 because of the close tolerances of the specifications. Research by the Association of American Railroads is directed toward use of lower quality diesel fuel.

C. H. Riesz

Thermal Cracking

Schutte, A. H. (assigned to The Lummus Co.) CONTINUOUS HYDROCARBON CONVERSION PROCESS AND APPARATUS. U.S. 2,561,420 (1951) July 24.

Heavy residues are heated to 700-900° F. and contacted with hot solid materials to form a distillate and a heavy liquid wetting the solid. This is passed to a second zone where controlled oxidation and heating to 1500-2500° F. completes the formation of distillate vapors while the reheated solid is returned to the first zone.

C. H. Riesz

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Burnside, J. P. THE USE OF SUBSTITUTES FOR GAS MANUFACTURE DURING PERIODS OF SHORTAGE OF NORMAL COAL SUPPLIES. p. 216

Stanier, H. PRODUCTION OF TOWN GAS BY THE CATALYTIC GASIFICATION OF PETROLEUM OILS. p. 216

7. ANALYTICAL METHODS AND TESTS

Gas Analysis

Klug, C. W. (assigned to Stewart-Warner Corp.) APPARATUS FOR DETECTION OF TOXIC GASES, ESPECIALLY CARBON MONOXIDE. U.S. 2,561,802 (1951) July 24.

An improved method and apparatus are described for the detection of carbon monoxide, using the "National Bureau of Standards colorimetric carbon monoxide indicating gel."

C. E. Hummel

Potts, J. E., Jr. (assigned to Tennessee Valley Authority) APPARATUS FOR GAS ANALYSIS. U.S. 2,561,414 (1951) July 24.

A simplified apparatus and method has been developed for determining the pressure of a contaminating gas in an atmosphere of known density. A hollow thimble having a gas-permeable wall is exposed to an atmosphere to be tested. An atmosphere of known density is then passed over the outside of the thimble. Suitable connections from both sides of the permeable wall lead to a manometer which measures differential pressures caused by the presence of a contaminating gas of different density.

C. E. Hummel

Stitt, F., Tjensvold, A. H. and Tomimatsu, Y. RAPID ESTIMATION OF SMALL AMOUNTS OF ETHYLENE IN AIR. *Anal. Chem.* **23**, 1138-1141 (1951) August.

An improved portable instrument has been developed for determining 5 to 200 p.p.m. of

ethylene in air, with an error of from 2 to 10 per cent. Mercury vapor formed by oxidation of the ethylene by mercuric oxide forms a black coloration on a paper strip which has been impregnated with red selenium. The length of this discoloration (with suitable corrections) is proportional to the ethylene concentration.

C. E. Hummel

Gas Calorimetry

Donnelly, R. P. A NEW MINI-GAS CALORIMETER. *Fuel* (British) 30, 178-181 (1951) August.

A simple calorimeter for low Btu gas using soap films to meter the inlet gas is described. It is applicable to approximately a 500 Btu/CF gas at the rate of 200 ml per min. Discrepancies can be attributed to local heating in the combustion zone and to improper ambient air temperature. Despite these errors, the Btu may be measured to within one percent accuracy.

S. Mori

Gas Density

Johnson, E. W. and Nash, L. K. A MAGNETICALLY COMPENSATED VAPOR DENSITY BALANCE. *Rev. Sci. Instruments* 22, 240-244 (1951) April.

A magnetically compensated buoyancy balance is described. This instrument provides precise and continuous indications of gas and vapor densities falling in the range of 0 to 4 g/1. Measurements can be made at temperatures that are freely variable up to 220° C; mildly corrosive vapors can be handled; and the data are automatically corrected for adsorption effects. The long term reproducibility of the readings is 0.001 g/1. Magnetic compensation is attained by adjusting the current in an external electromagnet until this magnet's interaction with a small permanent magnet sealed in the balance beam restores the beam to a standard null position. The virtually linear relationship between this "restoring" current and the ambient vapor density is established by calibration with a standard substance. High constancy of calibration has been achieved through the use of a special beam suspension which, though extremely friction free, is unaffected by repeated and relatively severe mechanical and thermal shocks.

Author's Abstract

Olefin Absorption

Savoy, M. (assigned to The Pure Oil Co.) CONCENTRATION OF OLEFINS. U.S. 2,561,822 (1951) July 24.

Olefins are removed from hydrocarbons by treatment with alcoholic solutions of an alkylolamine and a cuprous salt. Controlled acidification of the above reagent using organic and inorganic acids results in an increased solubility of the cuprous salt in the reagent, and increased capacity for the absorption of olefins. Data of tests using various acidic reagents are tabulated. Absorption capacities up to 26 cc. gaseous olefin per cc. absorbent were achieved.

C. E. Hummel

Moisture Determination

Fetzer, W. R. DETERMINATION OF MOISTURE BY DISTILLATION. *Anal. Chem.* 23, 1062-1069 (1951) August.

In the interest of economy the distillation procedure for moisture determinations should not be used if the conventional oven methods are applicable. When the distillation process is necessary, equipment should be carefully chosen and every effort made to follow the suggestions that have been found advantageous in the distillation technique. This article reviews the numerous applications of the distillation procedure, shows some of the basic designs in apparatus which will adapt the procedure to a specific product, and summarizes the best technique developed for its performance.

M. K. Enright

Willits, C. O. METHODS FOR DETERMINATION OF MOISTURE. *Anal. Chem.* 23, 1058-1062 (1951) August.

This resume correlates previous extensive studies and the theories and methods of thermal drying, particularly for organic and biological materials. It is the magnitude of the maximum difference between the vapor pressure of the water in or on the substance and that of the air in the dryer, together with charges in moisture-vapor diffusion rates that determines the rate of drying and the degree of drying possible by thermal methods. For a favorable differential a chemical drying agent is advocated and also the temperature employed should be high as possible without causing appreciable thermal decomposition.

M. K. Enright

Water in Gases

Weaver, E. R. ELECTRICAL MEASUREMENT OF WATER VAPOR WITH A HYDROSCOPIC FILM. *Anal. Chem.* **23**, 1076-1080 (1951) August.

Two types of detectors are used. One consists of a lithium chloride film, is commercially available for relative humidities above 5%, and can be adapted to recording and control. The other uses a sulfuric acid—phosphoric acid film, is much more sensitive, but requires the presence of an observer. Established uses are in determination of water in compressed gases and in determination of dryness of compressed refrigerants. Potential applications include: following of water evolution due to physical or chemical change; detection of substances easily converted to water, such as hydrocarbon gases; determination of water in solution in various liquids by measuring the water in the gas phase.

I. Ladany

8. GENERAL AND PHYSICAL CHEMISTRY

Adsorption

Barrer, R. M. and Robins, A. B. MULTILAYER SORPTION IN TERMS OF AN EQUATION OF STATE. *Trans. Faraday Soc.* (British) **47**, 773-787 (1951) July.

Weaknesses in the application of the B.E.T. and Hüttig adsorption isotherms when applied to a multilayer adsorption justify the present approach based on the van der Waals equation of state for the sorbed gas. The equation allows for both vertical and lateral interactions. Multilayer formation occurs below the critical temperature with a rather sharp pressure-dependent boundary between the dense and the dilute phases. Conditions leading to the various types of adsorption described in Brunauer's classifications are discussed. The influence of capillarity and surface structure on the isotherms is discussed.

S. Katz

Flame Pressure–Velocity Data

Bundy, F. P., Strong, H. M., and Gregg, A. B. MEASUREMENT OF VELOCITY AND PRESSURE OF GASES IN ROCKET FLAMES BY SPECTROSCOPIC METHODS. *J. Appl. Physics* **22**, 1069-1077 (1951) August.

A method for measurement of gas velocity and gas pressure in high velocity streams is described. The measurement of gas velocity is based on the Doppler shift of wavelength of radiation from the stream when viewed from different angles relative to the stream axis. The same apparatus is used to measure the gas pressure from the pressure shift of wavelength of the sodium radiation. Absolute accuracy was found to be about $\pm$ 1.5 x 10^4 cm/sec and about $\pm$ 0.3 atmospheres. This method is restricted to streams of very high velocity and to pressures of at least a few atmospheres.

D. L. Nicol

Flow System Laws

Morse, P. L. DEGREES OF FREEDOM FOR STEADY STATE FLOW SYSTEMS. *Ind. Eng. Chem.* **43**, 1863-1871 (1951) August.

This paper describes an attempt to develop laws applicable to flow systems comparable with the phase rules application to isolated systems. It is shown that flow systems have degrees of freedom for material and energy balances, design and operation. General equations predicting the degree of freedom are developed which are independent of physical design, and physical or chemical change. These relations make possible the design of flow systems with the prior knowledge of the proper number of design variables.

S. Katz

Hydrocarbon Kinetics

Ingold, K. U. and Stubbs, F. E. THE KINETICS OF THE THERMAL DECOMPOSITION OF OLEFINS. PART I. PROPYLENE. *J. Chem. Soc.* (British) 1749-1755 (1951) July.

In a study of the thermal decomposition of propylene, it was noted that polymerisation occurs as well as decomposition below 570° C. Above this temperature, the decomposition reaction is first order, with the transition to second order at lower pressures. A reaction mechanism is proposed of a somewhat speculative character, based on initial rupture to form a methane molecule and an activated species which combines with additional propylene. Secondary rearrangements and reactions form further meth-

ane, ethylene and hydrogen. An activation energy of 57.1 kcals. was reported.

S. Katz

Hydrogen Reactions

Eley, D. D. MOLECULAR HYDROGEN AND METALLIC SURFACES. *J. Phys. and Colloid Chem.* 55, 1017-1036 (1951) June.

Selected papers are reviewed which pertain to the nature of chemisorbed films of hydrogen on metals and their interaction with gaseous hydrogen.

C. H. Riesz

Laidler, K. J. MECHANISMS OF SURFACE REACTIONS INVOLVING HYDROGEN. *J. Phys. and Colloid Chem.* 55, 1067-1078 (1951) June.

The absolute rate theory is used to develop general rate expressions for the following reaction involving hydrogen: (1) hydrogen combination at surfaces; (2) production of hydrogen atoms at hot surfaces; (3) hydrogenation of olefins and (4) exchange reactions.

C. H. Riesz

Smith, H. A. and Bedott, W. C., Jr. KINETICS OF THE CATALYTIC HYDROGENATION OF THE NITRO GROUP ON PLATINUM. *J. Phys. and Colloid Chem.* 55, 1085-1104 (1951) June.

The kinetics of catalytic hydrogenation of the nitro group have been investigated for the following compounds in the presence of Adams platinum catalyst: nitroethane, nitrobenezene, nitromesitylene, nitrostyrene and 2-nitro-1-butene.

C. H. Riesz

Taylor, T. L. and Dibeler, V. H. CATALYZED REACTIONS OF UNSATURATED HYDROCARBONS WITH HYDROGEN AND DEUTERIUM. *J. Phys. and Colloid Chem.* 55, 1036-1066 (1951) June.

Mass and infra-red spectrometer methods have been used to study the reactions of butenes with hydrogen and deuterium in the presence of nickel catalyst. None of the previously proposed mechanisms completely explains the experimental results; the possibility of different mechanisms for ethylene is stated.

C. H. Riesz

Turkevich, J., Schissler, D. O. and Irsa, P. A STUDY OF THE INTERACTION OF ETHYLENE AND DEUTERIUM. *J. Phys. and Colloid Chem.* 55, 1078-1084 (1951) June.

The interaction of ethylene and deuterium over nickel catalyst has been studied by means of mass spectrometer analyses. The discovery of completely light ethane in the reaction products is surprising and suggests that ethylene saturation is effected by hydrogen that was previously on another ethylene molecule and only indirectly by the hydrogen molecule.

C. H. Riesz

Phase Equilibria

Culberson, O. L., and McKetta, J. J., Jr. PHASE EQUILIBRIA IN HYDROCARBON-WATER SYSTEMS. III-THE SOLUBILITY OF METHANE IN WATER AT PRESSURES TO 10,000 PSIA. *J. Petroleum Techn.* 3, 223-226 (1951) August.

Experimental and smoothed data are presented for the solubility of methane in water for temperatures of 77, 100, 160, 220, 280 and 340° F. at pressures to 10,000 psia. The minimum solubility phenomenon exists within this temperature range to pressures of 10,000 psia.

Author's Abstract

Weinaug, C. F., and Bradley, H. B. THE PHASE BEHAVIOR OF A NATURAL HYDROCARBON SYSTEM. *J. Petroleum Techn.* 3, 233-238 (1951) August.

The phase behavior of a naturally occurring hydrocarbon system whose critical temperature is near the reservoir temperature was determined in a favorable volume double-windowed cell. The data are presented in a graph as volume percent liquid versus pressure at several constant temperature. An anamolous behavior in the critical region in which the same volume percent liquid were observed at three pressures is reported.

O. T. Bloomer

9. ORGANIC CHEMISTRY

Aromatics Production

Mahan, J. E. (assigned to Phillips Petroleum Co.) ALKYLATION OF TOLUENE BY PROPYLENE CATALYZED BY ACID ACTIVATED MONTMORILONITE CLAY. U.S. 2,564,488 (1951) August 14.

Toluene is alkylated with propylene to form principally the para and meta isomers, the ortho isomer being less than 5%. The reaction conditions comprise a temperature in the range 400-560° F, a pressure of approximately 1000 psig and use of an acid-activated montmorillionite sub-bentonite catalyst.

C. H. Riesz

Aromatics Utilization

Potter, H. V. SOME PROBLEMS IN THE PLASTICS INDUSTRY. *Chem. and Ind.* (British), 656-665 (1951) August 4.

The plastics industry in England is discussed primarily in terms of the raw materials needed. Important raw materials—benzene, phenol, cresols—are derived from coal. Cost comparisons of English and American plastics are made.

C. H. Riesz

Hydrocarbon-Sulfur Reactions

Forney, R. C. and Smith, J. M. KINETICS OF CATALYTIC SULFURIZATION OF METHANE. *Ind. Eng. Chem.* 43, 1841-1848 (1951) August.

The kinetics of the methane-sulfur surface reaction were studied at 1112° F. and atmospheric pressure. The variables were catalyst (silica gel) bed depth, mole ratios of reactants and feed rates. Diffusional resistances had only a negligible effect and a simple second-order mechanism involving methane and diatomic sulfur appeared controlling. In the equation given, the value of k_c was 0.26 pound moles of carbon disulfide/pound catalyst-hour-atm.^{2} for the experimental conditions.

C. H. Riesz

Tarbell, D. S. and Harnish, D. P. CLEAVAGE OF THE CARBON-SULFUR BOND IN DIVALENT SULFUR COMPOUNDS. *Chem. Reviews* 49, 1-90 (1951) August.

The cleavage of the carbon-sulfur bond in divalent sulfur compounds has been reviewed and discussed based on 460 literature references.

C. H. Riesz

Ketone Synthesis

Reppe, W. and Magin, A. PRODUCTION OF KETONIC BODIES. U.S. 2,562,393 (1951) July 31.

Ketonic compounds are produced by reacting equimolar amounts of acetylene and carbon monoxide with water at about 212° F. and a pressure of at least 10 atmospheres in the presence of a potassium nickel cyanide as catalyst.

C. H. Riesz

Oxygenated Hydrocarbons

Small, N. J. and Ubbelohde, A. R. INERT GAS EFFECTS IN THE OXIDATION OF HEXANE. *Nature* 168, 201-202 (1951) August 4.

Oxidation of hexane vapors at low temperatures is inhibited more by dilution with hydrogen than with nitrogen. Apparently hydrogen as an inert gas is more efficient than nitrogen in an energy-transfer step important to continuing the chain reactions.

C. H. Riesz

Thiophene Reactions

Challenger, F. and Emmott, R. SUBSTITUTION PRODUCTS OF THE ISOMERIC THIOPHTHENS. THE STRUCTURE OF LIQUID THIOPHTHEN (THIOPHENO-2′:3′:2:3-THIOPHEN). *J. Inst. Petroleum* 37, 396-405 (1951) July.

The structures of liquid and solid thiophthen, formed by condensation of 2 thiophene rings, were studied.

C. H. Riesz

Vesely, J. A. (assigned to Universal Oil Products Co.) SEPARATION OF THIOPHENE BY SELECTIVE ALKYLATION. U.S. 2,563,087 (1951) August 7.

In this process thiophene is removed from aromatic hydrocarbons by treatment of the mixture with an olefinic hydrocarbon and an alkylation catalyst. The Friedel-Crafts metal halides, phosphoric acid, or mixtures of phosphoric and sulfuric acids are used as catalysts. Temperatures between 0° and 60° C and pressures up to 100 atmospheres are used. The thiophene alkylates thus formed are fractionally distilled

from the unreacted hydrocarbons. Negative sulfur tests are obtained for the hydrocarbon fraction thus treated.

C. E. Hummel

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Haensel, V. AROMATICS PRODUCTION BY THE PLATFORMING PROCESS. p. 219

Williams, C. R. PRODUCTION OF AROMATICS FROM NATURAL GAS LIQUIDS. p. 220

10. CHEMICAL ENGINEERING

Air Liquefaction

Alleman, C. E. and Quigg, D. J. (assigned to Phillips Petroleum Co.) METHOD AND APPARATUS FOR REMOVING CONDENSABLES FROM GASES. U.S. 2,561,720 (1951) July 24.

This invention relates to the production of relatively pure gases. It refers particularly to the preparation of oxygen from air, but generally to other processes such as removal of CO_2, moisture, H_2S, and higher hydrocarbons from natural gas. Difficulties with present purification processes are reviewed, and a new continuous process involving a *pebble chiller* is described. One claim refers to a method of compressing and cooling air to remove some moisture, passing to a countercurrent pebble chiller where remaining moisture, carbon dioxide and liquid air are formed in zones and removed. Liquid air is then fractionally distilled.

J. D. Parent

Bursting-Disk Pressures

Cousins, E. W. and Cotton, P. E. DESIGN CLOSED VESSELS TO WITHSTAND INTERNAL EXPLOSIONS. *Chem. Eng.* 58, 133-140 (1951) August.

Experimental data are presented on explosion pressures developed in closed vessels equipped wtih various sizes of rupture discs, when mixtures of hydrogen-air and propane-air are ignited by electric spark. Three vessels ranging in L/D ratio from 1.4 to 22 were tested at initial pressures of 0,15, and 45 psig and results plotted as explosion pressure versus vent ratio (Sq.ft. per 100 cu.ft. volume). Bursting discs employed measured 2.5 to 4.0 inches in diameter, with burst pressures of 64-272 psig. Abstractor's Note: The data are rather limited and a correlation with theory is required for estimating explosion pressures at conditions other than those investigated. C. von Fredersdorff

Catalytic Reactor

Funsten, S. R. (assigned to Filtrol Corp.) PROCESS AND APPARATUS FOR CATALYTIC REACTIONS AND ADSORPTIONS. U.S. 2,561,852 (1951) July 24.

A catalyst reactor is described for contacting vapors with descending solid catalyst. The catalyst is rabbled and agitated in a sequence of zones so that a large degree of contact is obtained in a countercurrent manner.

C. H. Riesz

Wickham, H. P., and Moorman, J. W. (assigned to M. W. Kellogg Co.) CONTACTING GASEOUS MATERIALS WITH FLUIDIZED SOLIDS. U.S. 2,562,225 (1951) July 31.

A fluidized catalyst converter for effecting hydrocarbon conversions has been improved by incorporating means for fluidizing in both dense phase and disperse phase zones. Catalyst is withdrawn from the dense phase for regeneration.

C. H. Riesz

Cooling Water Developments

Dresser, H. WATER COOLING EQUIPMENT. *Petroleum Engr.* 23C, 27, 30, 32-34 (1951) Reference Annual, July 15.

The development of water cooling equipment has been described, from the early spray pond up through natural-draft cooling towers, deck towers, and forced- and induced-draft towers. Conservation of water supply has always been foremost in the minds of the manufacturer. In addition, better water distribution and more efficient tower performance have been attained.

C. L. Tsaros

Kelly, R. C. WATER CONSERVATION. *Petroleum Engr.* 23E, 19, 22, 25, 26 (1951) July 15.

The problem of obtaining abundant, inexpensive, chemically clean, relatively cold water is discussed in the light of increasing industrial and domestic demand. The industrial user is cautioned to minimize the wasteful consump-

tion of water. The Cooling Tower Institute has been formed to improve the use of water conservation equipment. Some of the important factors to be considered in the selection and operation of this type of equipment are discussed.

C. L. Tsaros

Miller, D. COOLING-WATER TREATMENT. *Oil Gas J.* **50**, 139-150 (1951) August 23.

Maximum re-use of cooling water has become necessary in plants which experience dwindling supplies or complete absence of dependable sources. Re-use involves cooling systems, which may be open (cooled by evaporation) or closed (cooled by heat exchangers). Water requires treatment if it is corrosive or scale-forming. The control of scaling is determined by application of the Langelier, or $CaCO_3$ saturation, index. Several treatments are available for removal of calcium and alkalinity, – blowdown, lime precipitation, acid addition, phosphates, and zeolite. Corrosion may be prevented by deaeration and chromate inhibitors. Wood-destroying organisms, slime and organic matter removal requires chlorination, copper, or phenolic treatment.

O. P. Brysch

Townend, F. S. and Richards, R. O. COOLING WATER ON COKING PLANTS. Gas World (British) **134**, 75-86 (Coking Section) (1951) Aug. 4.

The general problem of cooling water supply for carbonizing plants is discussed, and temperatures, quality and pumping costs are given for some river and well waters. The detailed comment on water cooling plants includes ponds, natural-draft and counter-current towers, construction materials, water distribution, tower packing, mechanical draft and spray loss. Sketches of cooling towers and graphs of performance of each type are given. Modern theory and design are treated in some detail. The coke-plant water circuits for primary and secondary cooling, boiler house condensers, producer-gas scrubbers and benzol recovery are given brief separate mention, with inclusion of design and cost data, and typical cooling requirements.

O. P. Brysch

Explosion Pulverizer

Lobo, W. E. (assigned to The M. W. Kellogg Co.) METHOD OF EXPLOSIVE PULVERIZATION. U.S. 2,560,807 (1951) July 17.

The invention relates to a method of pulverizing coal by pumping a slurry of the coal and water into a pressure zone preliminary to explosive pulverization with steam. The steam is recompressed for re-use.

C. von Fredersdorff

Hammermills

Crites, J. (assigned to Combustion Engineering-Superheater, Inc.) PULVERIZING MILL SEPARATOR, HAVING WHIZZER AND DIRECTIONAL VANES. U.S. 2,561,564 (1951) July 24.

The patent relates to improvements in high-speed hammermill pulverizers for producing extremely fine products by recycling of oversize particles inside the mill casing. The recycling action is achieved by high-speed radial deflection blades which throw the oversize material against a bevelled circumferential ring which in turn deflects the particles back into the hammers. The operation depends on pneumatic conveying of the material through the mill, which is accomplished by an air exhaust fan coupled to the pulverizer shaft.

C. von Fredersdorff

Lykken, H. G. and Lykken, W. H. (assigned to Microcyclomat Co.) CLASSIFIER UNITS FOR FRIABLE MATERIAL PULVERIZERS. U.S. 2,561,388 (1951) July 24.

Various combinations of classifier units consisting of deflection plates, vanes and rods are described for use with air-blown hammermills.

C. von Fredersdorff

Heat Transfer Studies

Plunkett, R. A METHOD FOR THE CALCULATION OF HEAT TRANSFER IN SOLIDS WITH TEMPERATURE-DEPENDENT PROPERTIES. *Trans. Am. Soc. Mech. Engrs.* **73**, 605-608 (1951) July.

In heat transfer through a solid, where the heat capacity and thermal conductivity are temperature dependent, a simplification can be made which permits use of constant thermal conductivity and substitution of another vari-

able for temperature. This method is applied to heat flow through a brick furnace wall and is compared with the results of Dusinberre.

C. L. Tsaros

O'Donnell, R. J., Bowles, R. R. and Gullekson, E. E. HEAT TRANSFER BY DIRECT CONTACT BETWEEN LIQUID AND VAPOR. *Chem. Eng. Progress* 47, 309-314 (1951) June.

Plant performance data have been obtained from a three-stage system used to cool hot-vapor effluent from vapor-phase dehydrogenation reactors in a butadiene plant. The three stages are: a. concurrent spray section, 6 ft. dia. by 17 ft. long; a disc and doughnut section, 10 ft. dia. by 10 ft. long; and a side-to-side perforated baffle section, 10 ft. dia. by 14 ft. long. Vapor is cooled from 900° F. to 300° F. in stage 1, to 200° F. in stage 2, and to 120° F. in stage 3. Cooling oil at 100° F. was split between stages 2 and 3, collected, and fed to stage 1 at about 280° F. An overall enthalpy driving force was used in making calculations of performance coefficients, expressed as

$$U'A/V \times \text{Btu (hr) (cu.ft.) (Btu/lb.)},$$

and curves of U'A/V. vs. vapor-mass rate at a constant liquid rate, and vice versa, for each of the three stages are presented. Stage 1 is superior in performance over stage 2 at all calculations. Stage 3 is the best at low liquid and high vapor rates, and about equal to stage 2 at high liquid and low vapor rates.

C. L. Tsaros

Rohsenow, W. M. and Clark, J. A. A STUDY OF THE MECHANISM OF BOILING HEAT TRANSFER. *Trans. Am. Soc. Mech. Engrs.* 73, 609-620 (1951) July.

By high-speed photography it was possible to measure the bubble population in a boiling liquid. Equations are derived for estimating the heat required to form a bubble of a given radius. From these and the estimated rate of bubble formation, the rate of heat transmitted to the liquid by the condensation of bubbles can be calculated. Even under the most conservative conditions these estimates can account for only 10% to 25% of the increase in heat transfer obtained under boiling conditions with forced convection as compared with in boiling conditions. It appears that this increase is accomplished by agitation due to the formation and departure of bubbles. Reference is made to other investigations with gasified water, which show that before the boiling point is reached the heat-transfer rate increases similarly to the way degasified water does when it boils. Bubble formation is not steady, but periodic, and this is thought to be due to the flow of cooler liquid into the heated zone as bubbles move away.

C. L. Tsaros

Particle Size Separation

Matheson, G. L. (assigned to Standard Oil Development Co.) SEGREGATION OF SOLID PARTICLES. U.S. 2,561,396 (1951) July 24.

The inventor uses a packed column in which the fluidized solid particles (of a uniform density) are stratified into small, intermediate, and large sizes and may be separately withdrawn as side-streams.

O. P. Brysch

Piping Design

Manley, H. B. ECONOMIC LINE SIZING FOR PLANT PIPING. *Petroleum Refiner* 30, 151, (1951) July.

A chart is given for estimating economical pressure drops in pipe lines as a function of pressure and flowing volume.

C. von Fredersdorff

Reactor Design

Irvin, H. B., Olson, R. W. and Smith, J. M. DESIGN OF FIXED-BED CATALYTIC REACTORS. PART II. *Chem. Eng. Progress* 47, 287-294 (1951) June.

Temperature measurements were made in a small 2-in. I.D. fixed bed reactor, using 1/8-in. alumina pellets coated with 0.2% platinum to convert SO_2 to SO_3. Radial temperature measurements at various bed depths were made and the overall SO_2 conversion was measured. A modified Grossman method was used to predict temperature conditions throughout the bed. At mass velocities of 147, 350, and 512 lbs./(hr.) (sq. ft.) and at three radial positions, i.e. at the center of the bed and 0.4 and 0.8 of the distance to the wall, predicted and experimental curves of temperature vs. bed depth were made. The maximum and average deviations were 21° C. and 4° C., respectively, at the 0.4 and 0.8 points and 60° C. maximum at the center. Good

agreement between predicted and actual bulk mean conversions was obtained. The agreement is interesting, because mass transfer in the radial direction was neglected in the calculations which suggests that heat transfer is more important than mass transfer.

C. L. Tsaros

Scrubbing Towers

Conyers, L. A. GAS CLEANING APPARATUS. U.S. 2,560,635 (1951) July 17.

A gas scrubber is described which consists of a packed section composed of staggered blocks or baffles, a sprayhead to distribute the wash water over the packing, and an arrangement of troughs to collect the descending wash fluid beneath the packed section and carry it away. The wash liquid may be sent to waste or filtered and used over again.

C. L. Tsaros

Pearson, D. A., Lundberg, L. A., West, F. B. and McCarthy, J. L. ABSORPTION ON A SEMI-WORKS SCALE. ABSORPTION OF SULFUR DIOXIDE IN WATER IN A PACKED TOWER. *Chem. Eng. Progress* 47, 257-264 (1951) May.

Mass transfer rates for absorption of sulfur dioxide in water were determined in a tower 12-in. i.d., 24-ft. tall, packed to a height of 19.45 ft. with 1-in. ceramic Raschig rings. Because of close approach to equilibrium in many runs (60 to 97% saturated solutions of sulfurous acid) practically all available equilibrium data were closely studied, correlated and smoothed by a previously published method. Experimental data were calculated as H.T.U. values in terms of the normal equilibrium relations and also the pseudoequilibrium relations suggested by Vivian and Whitney for use with systems when solute reacts with the solvent at a rate such that the reaction is completed in the bulk of the liquid beyond the film. The results are much better correlated by the "pseudo" values. It is felt that the reported data can now be safely applied to the design of large-scale equipment.

C. L. Tsaros

Solid-Liquid Contacting

Lassiat, R. C. (assigned to Houdry Process Corp.) PROCESS FOR CONVERTING HYDROCARBON MATERIAL. U.S. 2,556,198 (1951) June 12.

The invention refers to a method of contacting liquid hydrocarbons with fluidized solids whereby the liquid is atomized on a freely flowing stream of solids or catalyst over an inverted cone.

C. von Fredersdorff

Tower Anchor Bolts

Gartner, A. I. NOMOGRAMS FOR THE SOLUTION OF ANCHOR BOLT PROBLEMS. *Petroleum Refiner* 30, 101-106 (1951) July.

Design equations and nomographs are presented for the determination of anchor bolt sizing for tall towers and stacks. Sample calculations are given.

C. von Fredersdorff

The following articles, the abstracts for which appear on the pages indicated, are also called to your attention:

Askins, J. W. FLUID CATALYST—GAS MIXING IN COMMERCIAL EQUIPMENT. p. 221

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Control

Linford, A. AUTOMATIC CONTROL. *Coke and Gas* (British) 13, 281-287 (1951) August.

Principles in automatic control over variables, such as flow, temperature, pressure, or liquid level are discussed. Three type of control mechanism, the proportional, integral and derivative are discussed. An extensive discussion of a pneumatic-type controller is also given in this article.

S. Mori

Btu Control on Separators

Miller, A. J. and Groebe, J. L. (assigned to Phillips Petroleum Co.) METHOD AND APPARATUS FOR CONTROLLING BRITISH THERMAL UNIT VALUE. U.S. 2,563,533 (1951) August 7.

This invention is concerned with precise concentration or separation of components of a gas such as natural gas by means of a solid adsorbent such as charcoal. The invention is applicable to the hypersorption process. In the

section of the tower where a decided change in composition takes place there is an appreciable change in temperature. Accordingly, temperature-sensitive elements are employed to control rate of flow of exit streams. A good correlation has been found between composition and heating value, making it possible to use a calorimeter to control the composition of the discharge gas or the flow rate of the adsorbent down through the tower. Also it is possible to control the flow rate of the side stream by means of a calorimeter.

J. D. Parent

Dust Detector-Recorder

ANALYZER CONTROLS GAS CLEANING EQUIPMENT AT BLAST FURNACES. *Steel* 129, 90 (1951) August 27.

The amount of dust in blast furnace gas is recorded through a balanced photocell arrangement. The gas moves through the sampling tube fast enough to keep the dust in suspension. More than a week of continuous operation can be obtained without changes in calibration due to dust deposits on the optical system.

I. Ladany

Level Recording Gage

Kemmerer, H. M. IMPROVING SCRUBBER PERFORMANCE WITH DIFFERENTIAL RECORDING GAUGE. *Gas* 27, 54 (1951) August.

The author describes the installation of a differential recording gauge to indicate the oil level difference at points between sight glasses, thus aiding in the prevention of high oil-carry-over and insufficient dust removal in a scrubber used by Southern Counties Gas Co. of California.

J. J. Guyer

Metal-Glass Seal

Davis, P. C., Gore, T. L. and Kurata, F. HIGH PRESSURE METAL-TO-GLASS FITTING. *Ind. Eng. Chem.* 43, 1826-1827 (1951) August.

A high pressure metal-to-glass connector utilizing end-thrust of glass tubing against a rubber O-ring is described. The closure can be assembled by hand to seal against pressures of 3000 psi.

O. T. Bloomer

Meter

Meyer, G. IMPELLER TYPE HIGH CAPACITY METER DEVELOPED BY GERMAN FIRMS. *Gas Age*, 108, 44-46, 78, 79 (1951) August 16.

Small meters of high capacity have been built by Hans Gehre of Elster & Co., Mainz, Germany. The model described comprises a hollow streamlined 2-part body supported axially in a cylindrical housing. A vaned impeller wheel rotates in the narrow gap between the front and rear parts of this body, coaxially with the body and housing. All gas must pass the narrowed annulus at this point, the two boundaries of which are shaped to nozzle and diaphragm profiles which cause the effective pressure (and rotation) to be closely proportional to the flow even for ranges down to 10% of normal. The rotary motion of the impeller shaft is transmitted by gears to an outside register. Dust passes through without interference, and calibrations made with air are shown mathematically to be correct for gas. Models from 6-in. diam. and 22 MCF capacity up to 16-in. diam. and 225 MCF are available.

B. E. Hunt

Pressure Calibration

Hejduk, A. A. (assigned to The Meriam Instrument Co.) PRESSURE MEASURING APPARATUS. U.S. 2,562,494 (1951) July 31.

This invention relates to a pressure measuring apparatus suitable for use in calibrating pressure indicating instruments. The apparatus is of the manometer type in which two or more manometers are so interconnected as to register pressures throughout a greater range than is possible with one manometer.

O. T. Bloomer

Waste Heat Boiler

Lewis, W. Y., England (assigned to Yorath Lewis Boilers Limited) WASTE HEAT OR SURPLUS HEAT BOILER. U.S. 2,555,043 (1951) May 29.

A waste-heat boiler is described wherein there is provided, in a single drum, a combination preheater or sensible heating section and a precipitation section together with a latent heating section for steaming.

C. L. Tsaros

12. MATERIALS OF CONSTRUCTION

Corrosion

Beck, W. ELECTROLYTIC PROBE FOR UNDERGROUND CORROSION STUDIES. *J. Metals* 3, 706-711 (1951) September.

A new type probe for underground current density measurements is described. A few practical applications are discussed.

B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL — CORROSION INSTRUMENTS. Part 24. *Oil Gas J.* 50, 136 (1951) August 16.

The theory and practice of the potentiometer-voltmeter, used for measuring the voltage existing on the pipe, is discussed. Switching and connections to increase the versatility of this instrument are shown.

O. P. Brysch

Parker, M. E. CORROSION AND ITS CONTROL—CORROSION INSTRUMENTS. Part 25. *Oil Gas J.* 50, 163 (1951) August 23.

Instruments for measuring soil resistivity are described. B. E. Hunt

Parker, M. E. CORROSION AND ITS CONTROL — MEASUREMENTS OF LINE CURRENTS. Part 26. *Oil Gas J.* 50, 89 (1951) August 30.

The technique of measuring the current flow on buried pipe is discussed. The use of voltmeters is discussed in some detail. B. E. Hunt

Pipe Coatings

Burrows, H. T. DEVELOPMENT IN COATING AND WRAPPING PIPE. *Petroleum Eng.* 23D, 25-26 (1951) August.

A standard engine screw-cutting lathe has been converted to a pipe-wrapping machine. Pipes from ½ to 30 in. diameter and 20 ft. long may be coated and wrapped on this machine.

B. E. Hunt

HEAVY COATING PERFORMS DUAL FUNCTION FOR BAYOU PIPELINES. *Gas* 27, 98-100 (1951) August.

The use of Somastic coating on Bayou Pipe lines is discussed. B. E. Hunt

Refractories

Williams, A. E. REFRACTORY CONCRETE IN GASWORKS. *Gas Times* (British) 68, 24, 27-29 (1951) July 13.

A refractory concrete which can withstand temperatures from 1300° C to 1600° C. has been developed. It has the following advantages: does not require prefiring, has no appreciable shrinkage on drying, can be subjected to sudden temperature fluctuations without spalling, and has a lower thermal conductivity than ordinary firebrick. Methods of its preparation and applications are discussed. A chart for this cement is given, whereby the outer wall temperature of a furnace may be obtained when the wall thickness and inside wall temperatures are known.

S. Mori

ZIRCON REFRACTORIES. *Brit. Coal Utilis. Res. Assoc. Quarterly Gaz.* No. 12, 4-6 (1951) (June).

Zirconium silicate (zircon sand) refractories are finding increasing industrial application because of their excellent resistance to high temperature dissociation (at 1800° C.), slag attack, and thermal shock. A variety of shapes including rods, insulating tubes, and crucibles are manufactured by slip casting and extrusion techniques. It was found that zircon refractories from impure zircon sand offer better resistance to slag attack than similar shapes made from purified material. The difference in behavior is attributed to the ability of the impure zircon to form a glaze on the surface which slows down the slag penetration.

C. von Fredersdorff

Structural Carbon

GRAPHITE ADVANCE. *Chem. Week* 69, 29-30 (1951) September 8.

Additional production capacity of impervious graphite for the manufacture of heat exchangers and process equipment is planned. The excellent thermal characteristics and corrosion resistance of impervious graphite make it an excellent material of construction for many process applications.

B. E. Hunt

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10

SULFUR POISONING OF NICKEL CATALYSTS

The Effects of Sulfur Composition, Sulfur Concentration and Rates of Natural Gasoline Feed Upon Conversion Efficiency and Catalyst Life of a Nickel Cracking Catalyst

and

A Brief Study of Nickel Sulfide Catalysts for the Cracking of Natural Gas

By

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